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INSTITUTE OF GAS TECHNOLOGY

THE GAS INDUSTRY'S OWN EDUCATIONAL AND RESEARCH FACILITY

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GAS ABSTRACTS

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1. GAS INDUSTRY

Aluminum Plant

NATURAL GAS SUPPLIES POWER TO MAKE ALUMINUM. *Steel* **127**, 102, 104, 106, 108-109 (1950) *July* 3.

Thirty million cu ft of natural gas are used each day to generate about 2,750,000 kwhr used to produce aluminum at the Point Comfort, Texas plant of Alcoa.

E. F. Davis

Changeover

Noyes, H. B. PUBLIC RELATIONS DURING CONVERSION FROM MANUFACTURED TO NATURAL GAS. *Gas Age* **106**, 32-35, 56 (1950) *July* 6.

Making the public understand the reasons for conversion to natural gas and how they will be affected by the conversion is an important part of the changeover job. A good public relations effort will prevent misunderstandings regarding new rates, time required for adaptation of appliances and other questions naturally arising in customers' minds. The types of information and media of dissemination are described.

J. C. Lane

Costs

GAS VS OIL VS COAL—A TABLE OF COMARATIVE HEATING COSTS. *Gas* **26**, 39-41 (1950) *July*.

A table for comparing the costs of gas, oil and coal as househeating fuels has been prepared by the Small Homes Council. The heating efficiencies taken into consideration in the table are based on data taken in two test homes at the University of Illinois.

J. C. Lane

COSTS AND RATES—SIAMESE TWINS? *Am. Gas Assoc. Monthly* **32**, 23-26, 60 (1950) *June*.

Increased operating costs of gas companies have created a problem whose only satisfactory solution seems to be increased rates. One company distributing straight natural gas has summed up its position as follows: salaries and wages to its men are up to $2.45 for every dollar spent in 1945; only 10.5 cents out of every revenue dollar is left for construction, retirement of debt, and dividends; tax relief is not expected; the possibility of increased business is not good except in the field of space heating which creates an unfavorable load factor. Encouragement of dual-fuel installations may partially alleviate the load-factor problem. Aggressive gas-appliance salesmanship is urgently required. Rate design tailored to earning requirements is explained and advocated.

J. C. Lane

House Heating

Jones, F. B. WHAT'S AHEAD FOR HOUSE HEATING. *Gas Age* **105**, 26-29, 54, 56, 58, 60 (1950) *June* 8.

The author postulates that in order to serve the best interest of company employees, customers and stockholders, the most practical approach to the house heating problem is to steer a middle course between maximum immediate and long range profits.

E. F. Davis

Inter-Industry Policy

Poe, E. H. INTER-INDUSTRY FUEL POLICY STUDY NEEDED AS BAR TO INCREASED REGULATION. *Am. Gas J.* **173**, 14, 46-47 (1950) *July*.

Business statesmanship is required to avoid the evils of uneconomic competition between gas, oil and coal on the one hand and the spectre of Federal restrictions on the other. Some circles have advocated a national fuel policy, presumably under a fuel czar, to regulate production and marketing. Competition from natural gas may make this idea seem attractive to some in the coal and oil industries, but thorough investigation of the restraints which would have to be imposed to enforce such control reveals that it would be mutually restrictive to all. A better solution can be worked out by the industries, themselves. Coal should find no difficulty in holding markets where it can offer greater economy, freeing the gas and oil industries to serve higher uses where cleanliness and automatic control are requisites. Techniques exist and can be further

developed to permit conversion of coal to more marketable forms, such as gas or synthetic liquid fuels. If markets for solid fuel are inadequate, the coal industry should exploit these newer techniques rather than rely on government regulation to enforce a market in its favor. As regards the oil industry's concern for its kerosene and fuel markets, the gas industry has need for these raw materials for gas production but must have assurance that costs will remain fairly stable before it invests large sums in high-Btu oil gas plants. Central economic research councils for each industry working in cooperation could resolve mutual problems and yet maintain the benefits of private enterprise.

J. C. Lane

LP-Gas

Coumbe, A. T. and Avery, I. F. LP-GAS GAINS TAPER OFF IN 1949, PROPANE USE WIDENS, SURVEY SHOWS. *Natl. Petroleum News* **42**, 19-20 (1950) *July* 12.

Instead of the 20-30% gains registered annually in 1945 through 1948, LP-gas sales in 1949 were only about 4% higher than those in 1948. Total LP-gas sales were 2,836,599,000 gallons of which over 1,400,000,000 gallons were propane. Propane sales were 10% higher than in 1948, while butane sales were 5% lower. A breakdown by uses in marketing districts is given.

J. C. Lane

Pipe Lines

AMAZING TOTAL OF 44,255 MILES PIPE LINES NOW PLANNED OR UNDER WAY. *Pipe Line News* **22**, 30-32 (1950) *July*.

Domestic and foreign pipe lines planned, approved, under construction or completed as of July 1, 1950, totaled 44,255 miles, some of which will not be completed until 1952. The mileage of new natural gas projects here and in Canada increased by 8,663 miles to 29,254 miles since January 1, 1950. A tabulation of projects, pipe sizes and mileage is given.

J. C. Lane

NATURAL GAS CONSTRUCTION DATA. *Gas Age* **105**, 34, 48-49 (1950) *June* 6.

An all-time record in FPC authorizations for pipe line construction was set in 1949. The lines authorized will add three billion cu ft per day to the nation's natural gas delivery capacity. Total cost of the 7537 miles of new pipe lines is estimated at $600 million.

J. C. Lane

Promotion

A MILLION POTENTIAL NEW CUSTOMERS AWAIT 'SELL 'EM COMFORT' CAMPAIGNERS. *Gas* **26**, 23-25 (1950) *July*.

The nation's gas companies anticipate adding more than one million new house-heating customers to their lines during the 1950-1951 season. This apparently conservative estimate is based on the announced expectations of 105 utilities which sell gas to more than 50% of the country's residential gas consumers. Shipments of new gas central heating equipment were 164.5% higher during the first five months of 1950 than during the corresponding period in 1949. The greatest pipe line construction program in history also points the way to vastly increased house-heating saturation.

J. C. Lane

Tidelands

Baker, H. H. TIDELANDS DECISION IMPERILS STATES' RIGHTS. *World Oil* **131**, 44-45 (1950) *July*.

A leading oil man views the Supreme Court's recent decision on the tidelands as a novel doctrine threatening confiscation and nationalization of all natural resources. Uncertainties concerning lease validity, rentals and royalty payments have already greatly slowed and may terminate exploration and development in the Gulf by private companies. Even without the confusion of jurisdiction, offshore operations are financially hazardous, and only a small part of the $230 million spent to date has been recovered from production. The Walter bill, now pending in the House, would resolve the conflicting interests of all involved.

J. C. Lane

Linz, B. F. TIDELANDS DECISION. *Oil Gas J.* **49**, 29-30 (1950) *June* 8.

The oil-bearing tidelands off the coasts of Texas and Louisiana are subject to the paramount rights of the Federal Government, the U.S. Supreme Court decided in opinions handed down on June 5. The decision was six-to-nothing in the case of Louisiana and four-to-two in the case of Texas. The dissenting opinion in the case of Texas was based on that state's sovereign rights as a republic prior to annexation. A bill to give the states clear title to offshore oil to the limits of their claimed boundaries has been reported by the House judiciary committee.

J. C. Lane

2. APPLIANCES

Burners

Harper, P. S., Lamar, C. C. and Peterson, V. C. GAS BURNER FLASH TUBE. U.S. 2,511,205 (1950) *June* 13.

Three claims were allowed for a self aligning flash tube pilot which will ignite range top and simmer burners and has means for control of secondary air to the lighter port.

E. F. Davis

INVESTIGATION OF PRIMARY AIR INJECTION BY USE OF VARIABLE CHAMBER PRESSURES. *Am. Gas Assoc. Laboratories Research Bull.* 55 (1950) *February.*

Equations expressing the theoretical relationship between primary air injection and burner characteristics were derived by equating the momentum of the gas jet at the orifice and the momentum of the mixture stream through a cross-section at the zero or neutral pressure point of the mixer tube. It was found that combustion chamber pressures ranging from +0.2 in. water column to −0.2 in. water column have no effect on primary air injection provided the whole burner is subjected to them. When the mixer face is outside the combustion chamber these small pressures have an effect on primary air injection but such a small change that it will not affect the flame stability.

E. F. Davis

Interchangeability

Shnidman, L. and Yeaw, J. S. USING THE ROCHESTER TEST BURNER TO PREDICT THE INTERCHANGEABILITY OF FUEL GASES, MANUFACTURED AND NATURAL. PC 50-13. Paper presented at the American Gas Association Production and Chemical Conference at New York, N. Y., May 22-24, 1950.

By measuring the air shutter opening of a modified laboratory Bunsen burner at the point where yellow tips, 1 in. cone, flash back, and lifting occur and analyzing this data with tests on appliance burners originally adjusted on either manufactured or natural gas, it is claimed that the limiting or border line interchangeability of any test gas with the adjustment gas can be determined. A complete outline of the procedure is given.

E. F. Davis

Research

UTILIZATION OF GAS. *Gas Research Board Communication* 55, 26-37 (1949).

The research projects of the Gas Research Board that are active are given below: of these only the first two are empirical. (1) The study of the effect of changes in gas quality on its combustion. The effect of changes in gas quality on combustion performance in an appliance depends on the combustion characteristics of the particular gas, as well as upon the performance of the particular appliance; there are, therefore, two projects: (a) the determination of the tolerance of appliances to variations in gas quality; and (b) A study of the combustion characteristics of gas mixtures. (2) The aerodynamics of the sphere of gaseous combustion. A knowledge of the flow phenomena in flames and gas streams is necessary in determining the structure and stability of flames and in studying both primary and secondary aeration; there are three projects at present: (a) The investigation of the structure and stability of diffusion flames using the shadow photography and Schlieren techniques; (b) The investigation of the primary aeration of burners and particularly, the study of air/gas ratios at very low thermal inputs; and (c) The quantitative

measurement of the secondary aeration of flames using the quartz-fibre anemometer and the powder method. (3) The study of high-speed combustion. The mechanism whereby very high rates of heat release can be obtained per unit volume of combustion space is not clearly understood, nor are the limiting factors for output; two projects are aimed at the increase of knowledge in this sphere and the possible incidental reduction of noise: (a) The study of the mechanism of operation of the concentrated combustion burner; and (b) The study of detonation combustion and the modification of high-speed combustion processes caused by ultrasonic waves or other means. (4) The study of flame speed. This project is being investigated by: (a) The measurement of the effect of preheat upon ignition velocity and combustion mechanism; and (b) The study of the kinetics of the rate controlling reactions in combustion.

Excerpt from article

3. COMBUSTION AND INDUSTRIAL FURNACES

Combustion of Carbon

Van Loons, W., and Smeets, H. H. COMBUSTION OF CARBON. *Fuel* (British) **29**, 119-121 (1950) *May*.

An examination of the literature together with additional experimental work leads to the conclusion that the primary product of the carbon-oxygen reaction is carbon monoxide. Traces of ozone have also been noted, formed, presumably, during the secondary oxidation of carbon monoxide. A diffusion controlled mechanism is assured.

S. Katz

Flame Studies

Hornbeck, G. A. and Herman, R. C. FURTHER STUDIES OF HYDROCARBON FLAME SPECTRA. *J. Chem. Phys.* **18**, 763-764 (1950) *May*.

Acetylene-oxygen flames, for which the C_2H_2: O_2 ratio is approximately unity, reveal band spectra attributed to C_2, OH and CH. The spectra from hydrocarbon flames appear to depend primarily on the fuel: O_2 or fuel: air ratio, and consist of overlapping bands difficult to interpret under conditions of low dispersion. All prominent structures can be attributed to the various diatomic radicals and molecules.

A. J. Rudnitzki

Orchard Heater

Pliske, B. GAS IS BEST FUEL FOR FIGHTING FROST. *Butane Propane News* **12**, 42-45, 48, 51-52, 54 (1950) *June*.

An LP-gas fired orchard heater has been found more effective in eliminating frost on trees than the smudge pot. A simple burner fires into a bed of rock laid on the surface of the ground which considerably reduces the convection currents through the orchard thereby eliminating local frosting. A large number of small capacity heaters are employed to obtain a uniform temperature pattern. Control and simplicity are the two main features of this burner.

E. F. Davis

4. CARBONIZATION AND GASIFICATION

Bulk Density of Coal

Van Ackeren, J. (assigned to Koppers Co., Inc.) APPARATUS FOR ADDING LIQUID TO CONTROL THE BULK DENSITY OF COKING COAL. U.S. 2,510,158 (1950) June 6.

The invention provides means for automatically regulating the bulk density of pulverized coking coals to a uniform value by controlled addition of water and oils, and means for automatically testing and controlling the coal for the conformity to a standard bulk density before its delivery to coke ovens.

C. P. Brysch

By-Products

Tiddy, W. (assigned to Allied Chemical & Dye Corporation) PROCESS FOR UTILIZING COKE OVEN GAS AND WASTE PICKLE LIQUOR FOR THE PRODUCTION OF AMMONIUM SULFATE. U.S. 2,511,306 (1950) June 13.

A process is described for the production of ammonium sulfate from coke oven gas, using waste pickle liquor as the scrubbing medium

in the first stage. The insoluble ferrous hydroxide, ferrous sulfide, and ammonium ferroferrocyanide are separated, and approximately 75% of the liquor recirculated. The remaining portion is oxidized by aeration to convert ferrous sulfate to ferric hydrate, and filtered. The aqueous solution is mixed with sulfuric acid in the second saturator, where the final portion of ammonia is removed from the gas, and ammonium sulfate is recovered in the customary manner.

W. E. Ball

Tiddy, W. and Cooper, F. D. (assigned to Allied Chemical & Dye Corp.) METHOD FOR THE UTILIZATION OF IMPURE COKE-OVEN GAS AND WASTE PICKLE LIQUOR IN THE MANUFACTURE OF AMMONIUM SULFATE. U.S. 2,511,307 (1950) June 13.

A process similar to U.S. 2,511,306 (above), except that pickle liquor is used in both stages, and ammonia is recovered as an aqueous solution of ammonium sulfate.

W. E. Ball

Coal Classification

Edwards, A. B. RANK AND TYPE OF SOME AUSTRALIAN COALS. *Fuel* (British) **29**, 125-133 (1950) *June*.

The author classifies Australian coals by a comparison of the proximate analyses of vitrain and run of mine coal. The fixed carbon content of the *vitrain* on an ash-free, seam moisture basis, is the numerical measure of rank. Plotting this for a series of coals against the fixed carbon content of the run-of-mine coals permits a differentiation of coal type, which can also be designated by a number. These numbers, with the ash content, may be used to calculate calorific value. Some relationships to quality of coke may be predicted.

O. P. Brysch

Coal Properties

Kreulen, D. J. W. CONCERNING THE B. S. SWELLING NUMBER OF COAL. *Fuel* (British) **29**, 112-117 (1950) *May*.

From his experimental results the author rejects the British Standard (1016:1942) swelling index of coal as presently specified. He objects to the lid as specified and obtains higher "free" swelling by covering with a second crucible. He shows that oxidation of the coal, during the sample preparation or during the swelling test, dominates the phenomenon of an increase in swelling number. Fresh coal yields a smaller swollen button because of low viscosity, whereas slightly oxidized coal yields a larger button because the more viscous mass does not collapse. Comparisons of results on 2 coals with the B. S. 705: 1936 agglutinating index, the Roga (Polish) index and the Arnu dilatometer curve show that the latter three tests define a progressive deterioration of coking properties with increased oxidation while BS 1016 shows improvement.

O. P. Brysch

Coke Ovens

Becker, J. (assigned to Koppers Co., Inc.) HORIZONTAL COKE OVEN METHOD. U.S. 2,498,784 (1950) February 28.

Coking is carried out in a horizontal coke oven wherein the width of the top portion of the chamber is greater than that of the major portion. This portion of enlarged width provides enlarged coal volume at this point, whereby coking by radiation is delayed, and thereby the overheating of the top space with formation of obstructing "roof-carbon" is decreased. Also the delayed coking of this top layer permits greater penetrability of the gases from between the viscous plastic seams in the charge below, whereby the internal pressure is relieved. The use of a higher bulk density or a higher moisture content in the coal of the top layer is claimed.

O. P. Brysch

Van Ackeren, J. (assigned to Koppers Co., Inc.) GAS-BURNER FOR COKE OVENS. U.S. 2,507,554 (1950) May 16.

A gas burner is described for heating under-jet coke ovens wherein a rich fuel gas is directed into a Venturi throat so as to inspirate waste gas and form a proportioned mixture for the burner nozzle. The inspirating tubes are fixed in the Venturi masonry shapes under each flue wall; and these blocks slide on the oven pad during expansion and contraction into expansion joints provided between the intermediate

shapes. The associated waste-gas tubes between the Venturi shapes also slide freely with expansion, but are gasketed with asbestos at the shape joints. Enlargements of the openings through the oven pad permits the fuel-gas pipe feeding the inspirator to move freely with its Venturi shape during expansion of the refractory structure, without losing its centered position.

O. P. Brysch

Coking Properties

Berkowitz, N. THE DISTRIBUTION OF COKING PROPERTIES IN BRITISH AND COMMONWEALTH COALS. *Fuel* (British) **29**, 138-143 (1950) *June*.

The author extends the theory proposed earlier in which he related the pore structure and coking properties of coals. The present study includes 190 coals from Borneo, Nigeria, Queensland and Pakistan which were abnormal in respect to properties usually associated with American and British coking coals. The coking properties are shown to depend neither upon coal rank or solvent-extractable matter, but upon air dried moisture content, *which must be less than 3.5%*. The swelling and agglutinating values *for coals of equal moisture contents then will be proportional to the volatile matter content* (since the gas pressure will vary if *different amounts of gas are evolved in similar pore structures*). This theory indicates that coke-forming conditions can only be developed in gel-like (bright or humic) coals, and that chemical composition enters into the coking process only in some more specific but secondary role which is impossible to define at present.

O. P. Brysch

Combustible Gas Composition

McGurl, G. V. (assigned to Koppers Co., Inc.) METHOD OF CHANGING THE COMPOSITION OF A COMBUSTIBLE GAS BY DIFFUSION. U.S. 2,497,898 (1950) February 21.

The composition and specific gravity of coke oven gas and producer gas are changed simultaneously by streaming the gases on opposite sides of a porous boundary at controlled rates of flow and differential pressures. Counter-current or concurrent flow with one-pass treatment is claimed. Producer gas may be converted to Fischer-Tropsch synthesis gas while the coke oven gas is increased in specific gravity from 42 to 50%.

O. P. Brysch

Distribution

Isaacs, W. H. and Paquette, R. B. CONTROLLED GAS MIXING. PC 50-17. Paper presented at the American Gas Association Production and Chemical Conference at New York, N. Y., May 22-24, 1950.

A calorimixer controls the position of two hydraulically operated butterfly valves in different gas lines which deliver the gases to a Torus mixing chamber at 800 Btu/cu ft ± 0.5%. The system is very stable in operation and has an operating range of approximately 10 to 1 in volume.

E. F. Davis

Lignites

Selvig, W. A., Ode, W. H., Parks, B. C. and O'Donnell, H. J. AMERICAN LIGNITES: GEOLOGICAL OCCURRENCE, PETROGRAPHIC COMPOSITION, AND EXTRACTABLE WAXES. U.S. Bureau of Mines Bull. 482.

Because the United States has been almost entirely dependent upon imports for montan wax, an investigation has been conducted of the yields and properties of extractable waxes of typical American lignites. Certain Arkansas and California lignites gave the largest yields of wax, the yields in these cases being comparable to German practice. In general, the waxes obtained by extraction with benzene were a higher quality than the benzene-alcohol mixtures. Petrographic examination showed that high wax-yielding lignites are attrital, only small quantities of wax being obtained from the xyloid lignites.

W. E. Ball

Mixed Gas

Hurd, J. S. NATURAL GAS OPERATION AT CENTRAL GAS WORKS. PC 50-39. Paper presented at the American Gas Association Production and Chemical Conference, New York, N. Y. May 22-24, 1950.

A discussion of natural gas reforming in the production of a substitute for 530 Btu carburetted water gas is given. Mixtures of reformed natural gas, natural gas-air, natural gas, carburetted water gas, and LP-gas for peak loads are used in this operation. Operating conditions and results for natural gas reforming on 11 ft. hand-clinkered U. G. I. sets are given.

H. R. Linden

Purification

Crawford, D. B. (assigned to Elliott Co.) GAS PURIFYING METHOD AND APPARATUS. U.S. 2,496,380 (1950) February 7.

A method of removing condensable impurities from gases by cyclic operation of reversing heat recuperators is claimed. This process was developed in conjunction with the Elliott cycle for oxygen production, and embodies the idea of reheating a pure gaseous stream to increase the vapor pressure of deposited solids in a heat exchanger thereby increasing the rate of sublimation of the solids to the pure gas stream.

C. Von Fredersdorff

Gollmar, H. A. COKEMAKERS FACE GAS PURIFICATION PROGRAM. *Steel* **127**, 102, 104 (1950) *July* 17.

The Koppers actification process removes and recovers both hydrogen sulfide and hydrogen cyanide from coke oven gas. The gas is scrubbed with a solution of sodium carbonate, which absorbs H_2S and HCN, and the solution is revivified by stripping with steam in a vacuum tower. The steam may be obtained from waste sources, such as hot flushing liquor. The hydrogen cyanide is recovered in the form of sodium cyanide solution or anydrous hydrogen cyanide, and the hydrogen sulfide may be used for the production of sulfuric acid.

W. E. Ball

Research

Fieldner, A. C. and Gottlieb, S. ANNUAL REPORT OF RESEARCH AND TECHNOLOGIC WORK ON COAL, FISCAL YEAR 1949. U.S. Bureau of Mines Information Circular 7565 (1950) June.

This report emphasizes the strong interest in the synthetic liquid fuels and in American reserves of solid fuels. Diamond and core drilling studies were made of coal areas in Alaska, Alabama, Colorado, Maryland, and North Carolina. Work on coking coal reserves was reported for Brazil and Chile and was continued in the U.S. in Pennsylvania, W. Virginia and Kentucky. These coals also were tested by the carbonization survey, in which composition, petrography and carbonizing properties were determined for 37 coals and 28 blends. Drying, storage and utilization of western low-rank coals were studied. Improvements in coal mining and preparation practice were studied for Alabama, Pennsylvania, W. Virginia, Oregon, Washington and Alaska coals. Lurgi gasification of North Dakota lignite and laboratory production of synthesis gas from many bituminous coals were reported. The Gorgas, Alabama underground gasification project has been operating since March, 1949. The Louisiana, Mo. demonstration plant for synthetic fuels has been operating in part; and extensive studies of all phases of coal hydrogenation and the oily products were reported.

O. P. Brysch

THE WORK OF THE GAS RESEARCH BOARD. *Coke & Gas* (British) **12**, 163-168 (1950) *May*.

This very brief review surveys the work of the Gas Research Board under the headings of Gas Production and Utilization. In the former, hydrogenation of coals to produce gas of 500 Btu content is described. Oxygen-steam gasification under pressure has been carried to the pilot plant stage. Experimental work on fluidized gasification systems are in progress. Gasification in a vortex chamber is discussed as a means of analyzing the stages of a solid-gas phase reaction. Other topics include methane synthesis, water gas production, sulfur removal,

gas-holder design and corrosion cracking of welded mains. Little work has been done on coke studies. In the field of utilization, much of the work has been covered with flame research. A theory for the cause of blow-off of luminous flames has been proposed, based on the transport of combustion products to the base of the flame by eddy currents. Studies of both primary and secondary aeration of aerated burners have been made. Some of the special tools used in flame study include spectroscopy and vibration analysis. Increasing the rate of heat release by increased rates of flame propagation has also been under investigation.

S. Katz

GAS PRODUCTION, PURIFICATION AND STORAGE. *Gas Research Board Communication 55, 5-9* (1949).

A yearly summary of work on gas production, purification and storage is presented. Some of the projects worked on consisted of: (a) gasification of coal in hydrogen under pressure using a weakly caking coal in a 300 lb converter; (b) gasification of coal in oxygen and steam in small scale experiments at 20 atm and 925-950 C (simulating Lurgi generator conditions); (c) gasification of coal in a fluidized bed system using weakly caking coals in a hydrogenation converter; and (d) gasification of coal in a vortex chamber. The vortex chamber has been used for both combustion and producer gas operation. A system of two vortex chambers in series is suggested, one for carrying out combustion of pulverized coal, the second for reacting excess carbon and steam with the hot combustion products. 3000-hr experiments on the catalytic synthesis of methane from carbon monoxide and hydrogen at atmospheric pressure were successfully completed. Purification of organic sulfur containing gases by hydrogenating catalysts has been partially successful. Copper-chromium catalyst supported on active carbon and operating at 400 C had a useful life of 3 months in reducing organic sulfur from 51 to 8.4 grains equivalent sulfur per 100 cu ft gas. A study of oxide purification of city gas disclosed the importance of correct humidification to prevent hardening of the iron oxide. Solvent extraction of spent oxide can produce sulfur up to 99% purity and yields a revivified oxide of greater activity than the original. A fluidized iron oxide system is under investigation. Wind stresses in gas holders and corrosion cracking of welded mains were also studied.

C. Von Fredersdorff

Water Gas Production

Blatchford, J. W. THE PRODUCTION OF WATER GAS WITH TONNAGE OXYGEN. PC 50-16. Paper presented at the American Gas Association Production and Chemical Conference, New York, N. Y., May 22-24, 1950.

Several standard 9 ft diameter by 9 ft high U. G. I. mechanical blue gas sets converted for oxygen service were operated continuously with steam-oxygen blast, simulating an up-draft producer. Results at average and high gasification rates are tabulated as follows:

	Average	High
Gasification rate, lb coke/sq ft hr	129	180
Operating hours	2890	45
Oxygen flow, cfm (0°, 760 mm)	1400	1957
Steam flow, lb/min	187	257
Oxygen purity, %	95.2	95.0
Oxygen/steam ratio, cf/lb	7.5	7.6
Coke rate, lb/hr	8,200	11,450
Oxygen/coke ratio, cf/lb	10.2	10.2
CO_2 in gas, %	16.9	16.6
H_2/CO ratio	0.73	0.70
Gas heating value, Btu/cu ft	258	260
Requirements,		
Coke, lb/Mcf	23.7	24.1
Oxygen, cf/Mcf	243	248
Steam, lb/Mcf	32.4	32.6
Gas make/24 hr, Mcf	8,300	11,400

Graphs are presented showing the variation of gas composition and steam decomposition with oxygen/steam ratio. Steam decomposition varied from 45 to 65%. Oxygen was supplied by a 360 ton/day Linde-Frankl plant recently installed at Belle. The tests show that the use of oxygen in coke gasification is advantageous from the standpoint of capacity, efficiency and maintenance of the generating equipment. No reasonable restrictions were apparent in either the quality of fuel or type of apparatus used.

C. Von Fredersdorff

Sampling

Visman, J. THE IMPORTANCE OF AUTOMATIC SAMPLING: POTENTIALITIES AND APPLICATIONS. *Fuel* (British) **29**, 101-105 (1950) *May.*

Consideration of the theory of sampling leads to the conclusion that a large number of increments must be collected if a high degree of accuracy is desired. Consequently, automatic sampling is mandatory for accurate quality control of the product. For the sampling of pulverized coking coal, an automatic pipe sampler was developed which collected 150 increments (of about 60 gm. each) per shift, with a calculated accuracy of 0.6% ash (99 out of 100). Because of segregation on the top surface and edges of the coal stream on the belt, it was found necesssary to sample from the interior of the stream.

W. E. Ball

The following article, the abstract for which appears on the page indicated, is also called to your attention:

Van Loons, W. and Smeets, H. H. COMBUSTION OF CARBON. p. 144

5. NATURAL GAS AND NATURAL GAS CONDENSATES

Carbon Black

Cox, J. T., Jr. HIGH QUALITY-HIGH YIELD CARBON BLACK. *Chem. Eng.* **57**, 116-117 (1950) *June.*

Careful control at the Sid Richardson Carbon Company leads to a high quality carbon black of comparatively good yield. The yield is 1 to 1.2 lbs per Mcf. A flow sheet is presented.

J. D. Parent

Conservation

Jones, P. J. A UNIFORM PLAN FOR APPLYING GAS CONSERVATION LAWS WITHIN A STATE. *World Oil* **130**, 45-46, 48 (1950) *June.*

A plan for uniform gas conservation within a state is outlined. The plan is based on assigning a ratable depletion rate expressed as a fraction per year of in place gas for each ratable reservoir in the state. Actual and calculated rates of depletion are also defined based on the production history of the reservoir. The application of the plan to several typical cases is presented. The plan offers a material inducement for cooperation between various groups, and should minimize the drilling of unnecessary wells in small tracts and edge leases.

O. T. Bloomer

Corrosion

Buchan, R. C. CORROSION IN CONDENSATE AND IN HIGH PRESSURE SWEET OIL WELLS. *Corrosion* **6**, 178-185 (1950) *June.*

The problem of corrosion in condensate and high pressure wells producing sweet oil is discussed. Tubing materials, coatings, and chemical injection are the various corrosion mitigation practices considered.

B. E. Hunt

Denison, I. A. CORROSION OF MATERIALS OF CONSTRUCTION UNDERGROUND. PART I. *Petroleum Engr.* **22D**, 5-8 (1950) *June.*

Tests constituting the underground corrosion section of the National Bureau of Standards field investigation of underground corrosion are reported. In most cases data are complete for certain classes of materials. In this article, the first of two parts, the results obtained from ferrous metals and alloys with emphasis on the effect of their composition are discussed. The results for iron and iron alloys may be summarized by stating that the addition of nickel, chromium, and molybdenum generally tends to reduce the corrosion of low alloy irons and steels in soil.

B. E. Hunt

Juppenlatz, J. W. CAST 12% CHROME STEELS PROVED IN GAS WELLS. *Iron Age* **165**, 85-89 (1950) *June* 22.

The intensive production program in the oil and gas wells in 1943 made corrosion control extremely important. A series of tests were conducted by the NACE-NGAA in an effort to find a metal suitable for Christmas-tree fittings and

well-head equipment. The results obtained indicate that cast 12% Cr steels were suitable materials.

B. E. Hunt

Kuhn, R. J. CATHODIC PROTECTION ON TEXAS GAS SYSTEM. *Petroleum Engr. Reference Annual* **22D**, 35-36 (1950).

The corrosion control experience obtained from the planning, construction, and follow-up of the 26 in. pipeline from Texas to Ohio are described. The procedure followed was to clean, prime, hot coat, wrap with a single layer of fiberglass, then apply cathodic protection to the entire pipeline.

B. E. Hunt

Stewart, W. H. CURES FOR CORROSION IN GAS CONDENSATE WELLS. *Petroleum Engr. Reference Annual* **22B**, 35, 38 (1950).

A summary is presented of the projects undertaken by the NGAA Corrosion Research Projects Committee. A study of coatings, inhibitors, and alloys has been made to determine their efficiency in the mitigation of gas condensate well corrosion.

B. E. Hunt

Dehydration

Peahl, L. H. INSTALLATION, OPERATIGN, AND PERFORMANCE OF A SKID-MOUNTED GAS-DEHYDRATION PLANT. *Oil Gas J.* **49**, 92-94, 96 (1950) *July* 13.

Two skid mounted dehydration plants of 12.6 MMcf per day capacity are being used by the Southern California Gas Company at its Kettleman Hills Station. Triethylene glycol is used. Operating cost is 20¢ per MMcf. A flow sheet and plant performance data are given.

J. D. Parent

Wilkinson, E. P. and Sterk, B. J. USE OF SOLID ADSORBENTS IN NATURAL GAS DRYING. *Petroleum Engr. Reference Annual* **22D**, 30-32, 34 (1950).

Results are presented of laboratory and plant-scale tests set up to evaluate Sovabead (spheroidal form of silica-gel) for drying natural gas. The performance of the material under variable conditions of velocity, humidity, and method of regeneration are reported.

O. T. Bloomer

Distribution

Howell, F. D. EXPERIENCES WITH COMPLETE REPLACEMENT OF NATURAL GAS SENDOUTS. PC-50-15. Paper presented at the American Gas Association Production and Chemical Conference at New York, N. Y., May 22-24, 1950.

A system initially adjusted on 1040 Btu, 0.635 gravity natural gas was later adjusted for use of a supplemental 1120 Btu propane-air mixture. Due to limited supply of both natural gas and propane an oil gas plant was constructed from the ground up. The 966 Btu, .707 gravity oil gas was found to be a reasonably supplemental mixture.

E. F. Davis

LaViolette, W. A. REMOTE CONTROL TELEMETERING AND CABLE GOES INSIDE THE GAS PIPE LINE. PART II. *Gas Age* **105**, 40-44, 65-66, 68-71 (1950) *May* **11**.

A detailed description is given of the installation of a remote control and telemetering cable inside a large diameter pipe line operating at 500 psi.

O. T. Bloomer

Hydrocarbon Recovery

Slobod, R. L. (assigned to Atlantic Refining Co.) METHOD AND APPARATUS FOR RECOVERING HYDROCARBONS FROM GASEOUS MIXTURES BY FREEZING. U.S. 2,512,-040 (1950) June 20.

The major concern of the invention is more efficient recovery of hydrocarbons from soil gas in geochemical prospecting. A modified cold trap is disclosed.

J. D. Parent

NEW CONDENSATE RECOVERY PROCESS. *World Oil* **131**, 168 (1950) *July*.

A brief explanation is offered of a new separator. Claim is made that hydrate trouble is absent and liquid recovery is high. Water is separated at well head pressure along with a small amount of hydrocarbon liquid. Gas expands to lower pressure causing self-cooling and hydrocarbon liquid formation. This liquid and a small amount of water drop to a point where

they are warmed by incoming well fluid. Gas leaves the separator cool and dry. Liquids dump automatically into the second stage flash chamber and then to stock tanks. No flow sheet or illustrative sectional drawings are offered. The unit has been on test for three years by Parkersburg Rig & Reel Company.

J. D. Parent

Leak Detection

Mueller, F. P. GAS LEAK DETECTION PRACTICES. PC 50-14. Paper presented at the American Gas Association Production and Chemical Conference, New York, N. Y. May 22-24, 1950.

In this paper the results of a survey of the gas leak detection practices used by several gas companies are presented. The following general observations summarize the practices followed: (1) it is inadvisable to attempt to locate and identify flammable gases by any one type of instrument; (2) the instrument used should be responsive to the particular gas expected and at the same time indicate the presence or absence of all flammable gases; (3) atmospheres from confined areas to be entered by workmen should be examined by combustible gas indicators followed by gas analysis; (4) gas leaks affect trees and other vegetation so some companies make vegetation surveys; (5) gas odors either inherent or added are often helpful in locating leaks; however, the absence of odor should not be considered as proof that a gas leak does not exist; (6) gas volume discrepancies between meters located at some distance from each other may be used as an indication of the possibility of leaks in the distribution system. Some of the more common combustible gas indicators and detecting devices on the market are tabulated in the article.

O. T. Bloomer

Liquefaction

Copper, H. C. NATURAL GAS LIQUEFACTION. U.S. 2,500,118 (1950) March 7.

The invention relates to liquefaction of natural gas for storage, particularly to gases high in nitrogen, the principal object being to eliminate the nitrogen without appreciable loss of valuable components. Complete liquefaction by means of cascade refrigeration involving ammonia, ethylene and methane is suggested. Nitrogen is then removed in a plate tower.

J. D. Parent

Gammill, O. E., Jr. (assigned to Carrier Corporation) LIQUEFACTION AND GAS BOOSTING SYSTEM. U.S. 2,508,821 (1950) May 23.

The invention relates to the recovery of certain constituents of a mixture by partial liquefaction resulting from refrigeration. A specific application is to natural gas.

J. D. Parent

Natural Gasoline

Lacey, F. H., Jr. and Kraft, W. H. THE CYMRIC ABSORPTION PLANT. *Petroleum Engr. Reference Annual* 22C, 3, 5-8 (1950).

A description is given of the absorption plant which processes gas from the Cymric oil field in California. Gas is gathered at 25 lb and 125 lb pressure. The absorber is operated at 425 psi. The plant is designed to recover 60% of the butanes with a gas rate of 30 MMcf per day. The absorption column is equipped with a side draw-off tray which can be used for intercooling the absorber if it is desired to achieve propane recoveries of the order of 90%. The only additional equipment required will be a side circulating pump and the oil chilling unit. It is anticipated that the high LP-gas recovery will be used as the pressure of the reservoir drops off with a resulting increase in the richness of the gas. A combination rich oil rectifier and reabsorber is employed. The reabsorber retains 90% of the propane in the rich oil while deethanizing this stream so that the fractionator feed contains less than 2% ethane. Results are presented of plant tests on the operation of the main absorber and reabsorber.

O. T. Bloomer

Thornton, D. P., Jr. NEW SEELIGSON PLANT MAKES FIRST USE OF CENTRIFUGALS TO COMPRESS RAW GAS. *Petroleum Processing* 5, 714-718 (1950) *July.*

A flow sheet is given for the Seeligson plant, a feature of which is the use of two six-stage

centrifugal compressors, each designed to handle 35 MMcf per day from 10 inches of mercury vacuum to 36.6 psig. Great flexibility is claimed.

J. D. Parent

Odorization

Dotterweich, F. H. NATURAL GAS ODORANTS. *Gas Age* **10**, 23-24, 51-52, 54 (1950) *June* 6.

Room tests provide rapid and economical evaluation of odorants for natural gas. While such data are preliminary, they serve to speed up and simplify the final selection of satisfactory odorizing agents. Detailed procedures for conducting odorization room tests are outlined.

A. J. Rudnitzki

BIBLIOGRAPHY AND ABSTRACTS—GAS ODORIZATION. PC 50-41. Paper presented at the American Gas Association Production and Chemical Conference at New York, N. Y., May 22-24, 1950.

Annotated bibliographic references covering the subject of gas odorization over the period 1919 to 1950 are presented. Articles are arranged chronologically with patent references segregated from literature references. A total of 91 references are included, 69 from the literature and 22 from patents.

H. Hakewill

Peak Shaving

Stafford, R. W., Gustafson, H. W. and Erwin, J. H. PROPANE AIR PEAK SHAVING PLANTS AT ROCKFORD AND FREEPORT, ILL. *Gas Age* **106**, 18-20, 57-58 (1950) *July* 6.

The utility converted to natural gas in 1946, redesigning two water gas sets for high Btu oil gas for peak shaving and emergency requirements. Oil gas is to be used for protracted peak periods and a new propane-air plant is to be used for extreme peaks. Construction details for the propane-air plant are presented.

J. D. Parent

Production

Augsburger, C. H. GULF COAST PILOT FLOOD IN 11,000 FT. GAS CONDENSATE RESERVOIR. *Oil Gas J.* **49**, 316-318 (1950) *June*.

A pioneering pilot water flood of an 11,000 ft deep condensate reservoir has begun in Old Ocean field. Incomplete tests on water injectivity indicate that the injectivity decreases to a minimum value for any set rate of injection with a definite cumulative injection of water after back-flowing the well. A flow sheet is given.

J. D. Parent

Barnes, B. C. NEW MAMOU FIELD PROCESS PLANT HAS FACILITIES FOR 7,000 MCF. *Oil Gas J.* **49**, 189, 191 (1950) *June* 22.

A plant is described for processing 7,000 Mcf per day of oil well separator gas to remove LPG and natural gasoline and compress residue gas to 1,000 psi for sale. Propane recovery is 45%. Absorption pressure is 300 psig and rich oil is flashed to a contactor-reabsorber at 65 psig where some stripping of light components is effected with vapors from the raw gasoline surge tank. Single still stripping is employed and the product is debutanized to produce gasoline, and the overhead product is then deethanized to produce LPG. Deethanizer product is partially recycled to the absorber and part goes to the rich oil contactor.

J. D. Parent

Brown, C. K. and Mason, W. D., Jr. CENTRAL CONTROL OF A GULF COAST PRESSURE MAINTENANCE PROJECT. *Oil Gas J.* **49**, 206, 208, 211, 213 (1950) *June* 22.

A description is presented of a centrally controlled pressure maintenance project in a Gulf coast field. The heart of the automatic control is a 20 unit time cycle controller which is electrically driven. Each cam makes one revolution per 24 hrs and segments on the cams can be used to start or stop production from a particular well. The time cycle controller actuates pilot valves which in turn actuate the large diaphragm motor valves to open or close. The panelboard contains three ring balance type,

self integrating orifice meters, four pressure controllers and pressure gages.

W. J. Merwin

Calhoun, J. C., Jr. ENGINEERING FUNDAMENTALS: PERMEABILITY CAPACITY DISTRIBUTION. *Oil Gas J.* **49**, 87 (1950) *June* 8.

In using permeability for flow computations it is necessary to consider total permeability capacity rather than permeability. The permeability capacity is a measure of the importance of a given permeability in its contribution to total flow. Method of constructing permeability capacity curves are presented. A suggested use of these curves is in the determination of the lower limit of permeability that need be considered in flow problems.

O. T. Bloomer

Doll, H. G. THE MICROLOG—A NEW ELECTRICAL LOGGING METHOD FOR DETAILED DETERMINATION OF PERMEABLE BEDS. *T. P.* **2880**. *J. Petroleum Technol.* **2**, 155-164 (1950) *June*.

A new electrical logging method is described which measures the resistivity of small volumes of material near and behind the wall of the bore holes. The very small electrode systems used are supported in the face of the flexible insulator pad of appropriate dimension maintained in contact with the wall. The measurements are recorded simultaneously with two different electrode spacings. This method provides a very detailed record of the formations and particularly of the permeable beds traversed by the bore holes. The application of MicroLog to the location of permeable zones within compact formations, such as limestone, and to the determination of the amount of sand existing in sequences of thin shale and sand streaks is discussed. The possibility of quantitative determination, providing a step toward the evaluation for formation porosity and mud cake thickness, is also examined. Field examples illustrate the essential features of the method.

Author's abstract

Knowlton, D. R. and Masters, R. W. GAS INJECTION PROJECT. TEMBLOR ZONE, KETTLEMAN NORTH DOME FIELD. *Oil Gas J.* **49**, 93-95, 97 (1950) *June* 15.

The oil and gas production history of the North Dome field in the Kettleman Hills, California is reviewed. The field was discovered in 1928 and large scale gas injection into the gas cap was begun in 1942. This program has arrested the rapid oil production decline.

O. T. Bloomer

Menzie, D. E. and Nielsen, R. F. THE MECHANISM OF AIR-GAS DRIVE. *World Oil* **130**, 212, 214, 216, 220, 224, 226 (1950) *June*.

The effect of pressure gradient during secondary recovery processes upon the ultimate recovery of oil has been evaluated in a series of experiments. The experimental study was made on an air drive mechanism in a consolidated sandstone core 100% saturated with brine. Saturations were measured by conductivity on separate sections of the core. Volumetric measurements were made of gas and liquid production and curves are presented to show the production histories. The data seem to suggest that the pressure gradient does not affect the ultimate recovery provided the end effect of the core is eliminated.

O. T. Bloomer

Wright, J. C. NEW DISPLACEMENT METHOD FOR MEASURING GAS FLOW. *Gas* **26**, 116, 118, 121 (1950) *May*.

See *Gas Abstracts* **6**, 67 (1950) *April* for abstract.

Storage

Spangler, C. V. A SAFER WAY TO STOCKPILE NATURAL GAS. *Gas* **26**, 62, 64 (1950) *May*.

The possibility of storing natural gas in granular beds of Fuller's earth has been indicated as practical by recent pilot plant tests. Storage is accomplished by introducing liquefied natural gas on top of a bed of Fuller's earth where the material is adsorbed. Regasification is effected by circulating hot natural gas through the bed. 300 cu ft of gas at standard conditions can be

adsorbed for each cu ft of adsorbent. Adsorbed methane is said to be much less of a fire hazard than liquefied methane and the decreased fire hazard of the adsorbent storage method is stressed. Preliminary estimating of the costs of storage by this method are $20 to $22 per Mcf of installed capacity.

O. T. Bloomer

Spangler, C. V. STORAGE OF LPG FUELS AT LOW PRESSURE. *Petroleum Refiner* **29**, 86-88 (1950) *June*.

The use of a solid bed of Fuller's earth to adsorb propane and butane is advocated as a method for storing these materials at low pressure. This method has possibilities for adoption into the design of ocean tankers and river barges. The adsorbed propane and butane are said to be much less of a fire hazard than liquefied propane or butane.

O. T. Bloomer

Transmission

Currens, J. E. C. EXPERIMENTS MADE IN INSTALLING SERVICES ON PRODUCTION LINE BASIS. PART II. ACTUAL FIELD TEST. *Am. Gas J.* **172**, 42-43, 46-47, 58-59 (1950) *May*.

Part II completes this series on service installations on a production line basis. Principal points of interest are a simple trenching machine and the use of a jeep or tractor mounting a split backfilling blade. Chief advantages of organizations of construction crews on a production line basis are flexibility in planning work and more efficient use of available man hours. This allows use of smaller crews and cuts overhead.

W. G. Bair

Dawe, H. F. and Wade, H. N. KIT CARSON STATION. PART I. *Petroleum Engr.* **22D**, 21-22, 24, 26 (1950) *May*.

A description is given of the Colorado Interstate Gas Company compressor station recently completed near Eads, Colorado. With this station the capacity of the 20 in. line which runs from the Hugoton field to Denver has been increased from 100 to 180 MMcf per day. The station has seven 1200-hp angle type compressors. The cooling water system is described in detail. Because of a shortage of water the engine jacket water is cooled in an aerial cooler.

O. T. Bloomer

Koenig, E. A. CENTRIFUGAL COMPRESSORS ON THE TEXAS EASTERN TRANSMISSION CORP. SYSTEM. *Oil Gas J.* **49**, 66-68 (1950) *June* 29.

Some operating data for the centrifugal compressors on the Texas Eastern line are given. Electric motors have given excellent service in spite of considerable overloading. Oil consumption by the engines is very low. Some power requirement graphs are furnished.

J. D. Parent

6. PETROLEUM AND SYNTHETIC LIQUID FUELS

Corrosion

Doremus, E. P. and Doremus, G. L. CATHODIC PROTECTION GOES OFFSHORE. *Oil Gas J.* **49**, 222, 225, 227-228 (1950) *June* 22.

Cathodic protection has proved to be the most economically feasible method of protecting underwater structures necessary for off shore drilling and production. Sacrificial anodes have proved to be the best source of the protective current. In practice, the structures are first polarized at high current densities before the current requirements can be reduced. This treatment serves to lay down on the steel a protective coating consisting principally of $CaCO_3$ and $Mg(OH)_2$.

B. E. Hunt

Shock, D. A. and Sudbury, J. D. CORROSIVE ENVIRONMENTS AND METHODS OF MITIGATION IN PRODUCING SOUR CRUDE. *Oil Gas J.* **49**, 73-74, 76 (1950) *June* 8; *Petroleum Engr.* **22B**, 42, 45-46, 48 (1950) *June*.

The basic divisions of corrosive environments are described as follows: well, aqueous, hydrocarbon, and vapor environments. These divisions are discussed as to the corrosive factors present and as to the mitigation procedures available. Generally it has been found that coatings provide the lowest cost protection.

B. E. Hunt

Fischer-Tropsch Synthesis

Bruner, F. H. (assigned to Texas Company) HIGH-PRESSURE LOW-TEMPERATURE CATALYTIC CONVERSION OF CARBON MONOXIDE. U.S. 2,508,743 (1950) May 23.

In the conversion of a mixture of carbon monoxide, hydrogen and olefin into carbonylic products, the metal carbonyl formed by reaction of carbon monoxide with the catalyst is recovered in a second zone containing a surface-active material such as diatomaceous earth. Periodically the process is reversed so that the second zone becomes the reactor with the former reaction zone serving to recover the metal carbonyl.

C. H. Riesz

Voorhees, V. (assigned to Standard Oil Company) PROCESS OF APPLYING PROMOTERS TO CATALYST PARTICLES. U.S. 2,500,331 (1950) March 14.

In promoting a powdered catalyst for use in fluidized form, the powdered catalyst is separated into fractions of narrow particle size ranges which are impregnated with more concentrated solutions as the size increases. The fractions are then recombined. An iron catalyst promoted by alkali and alkaline earth compounds for use in the fluidized synthesis of hydrocarbons from carbon monoxide and hydrogen is claimed specifically.

C. H. Riesz

Hydrocarbons

Griswold, J., Chew, J. and Klecka, M. E. PURE HYDROCARBONS FROM PETROLEUM. *Ind. Eng. Chem.* **42**, 1246-1251 (1950) *June.*

Liquid phase equilibria have been determined for the three ternary systems involving water and aniline with each of the three hydrocarbons, n-heptane, methylcyclohexane and benzene at 25° and 50° C. The value of data of this nature in the design of extractors for the recovery of aniline from hydrocarbons or corrosive aqueous systems is indicated.

S. Katz

Hydrogen Sulfide Removal

Zahnstecher, L. W. LIQUID-PHASE HYDROGEN SULFIDE REMOVAL. *Petroleum Refiner* **29**, 107-110 (1950) *July.*

A refinery C_3-C_4 gas stream containing 300 grains of H_2S per 100 cubic feet and 1% CO_2 at the Mid-Continent Petroleum Corporation is treated by the tripotassium phosphate process under license from the Shell Development Company. The operation of the plant is described.

C. H. Riesz

Hydrogenation

Basu, A. N. and Glenn, R. A. CHEMICAL NATURE OF COAL HYDROGENATION PRODUCTS. IV. USE OF MOLECULAR DISTILLATION WITH REFLUX AND OF EXTENDED LIQUID SHROMATOGRAPHY. *Fuel* (British) **29**, 134-137 (1950) *June.*

Bands II and IV, obtained by alumina chromatography of the oils from the hydrogenation of Pittsburgh seam coal, contains a concentration of the oxygen- and nitrogen-containing compounds. Further chromatography with silica and with alumina, molecular distillation, and characterization of the fractions by chemical and physical analyses is described. The neutral nitrogen is probably contained in condensed pyrrole ring compounds. The neutral oxygen is divided between compounds containing acetylatable hydroxyl groups of alcohols and or sterically hindered phenols, and compounds containing cyclic ether linkages.

C. H. Riesz

Orchin, M. and Storch, H. H. HYDROGENOLYSIS OF PHENOLS IN MIDDLE OILS FROM COAL HYDROGENATION. *J. Soc. Chem. Ind.* (British) **69**, 121-122 (1950) *April.*

Middle oils from the hydrogenation of coal were subjected to hydrogenolysis in the absence of added catalyst. Whereas the original material contained 2.9% phenols boiling below 230° C, the product hydrogenated at 842° F contained 5.8% phenols while the product obtained from hydrogenation at 887° F contained 9.1% phenols, both values based on the charge. These and other experiments indicated the compara-

tive stability of the phenolic linkage toward hydrogenolysis.

C. H. Riesz

Sherwood, P. W. HIGH-PRESSURE HYDROGENATION OF CARBONACEOUS MATTER. PART VI. THE VAPOR PHASE IN INDUSTRY. SECTION A. *Petroleum Refiner* **29**, 113-117 (1950) *June*.

The main function of vapor phase pressure hydrogenation is to convert high boiling vaporizable oils into lighter products, particularly gasoline. Pure tungsten sulfide (catalyst 5058) used at 790-840° F is resistant to nitrogen and phenolic oxygen poisons usually present in middle oils obtained from coal hydrogenation. This first operation, known as presaturation, is carried out at 4400 psi and some 30% of gasoline may be formed. A second operation, known as splitting, causes a 60-70% conversion at temperatures of 750-790° F and at a pressure of 4400 psi. The most commonly used catalyst is diluted tungsten sulfide on a Fuller's earth base (catalyst 6434). In both steps, it is usually necessary to add hydrogen sulfide to maintain the catalyst in the sulfide form, the amount being from 0.4 to 1% by weight of the oil charged. Other catalysts for presaturation and splitting as well as salient features of vapor phase pressure hydrogenation are described.

C. H. Riesz

Sherwood, P. W. HIGH-PRESSURE HYDROGENATION OF CARBONACEOUS MATTER. PART VII. THE VAPOR PHASE. SECTION B. *Petroleum Refiner* **29**, 124-128 (1950) *July*.

Vapor-phase hydrogenation in two stages at 4400 psi pressure and in one stage at 10,300 psi are discussed and compared. The single-stage method simplifies product distillation but yields per pass must not exceed 40% in order to avoid excessive gas formation. The single-stage product is suitable as an aviation gasoline base but the two-stage product must be hydroformed to increase its aromatics content. Use of hydrogenation in conjunction with thermal as well as catalytic cracking leads to improved yields and quality of gasoline from petroleum feed stocks.

C. H. Riesz

Skinner, L. C., Donath, E. E., Schappert, H. and Frese, E. RESIDUAL OIL HYDROGENATION. *Petroleum Refiner* **29**, 83-86 (1950) *July*.

Use of hydrogenation to upgrade cracked residuum is described. Costs for operating a 16,500 bbl/day plant are computed to be 3.36 cents per gallon of feed with amortization in 15 years. Payout time for the plant will range from 4.3 to 9.5 years based upon average market prices in the Atlantic Coast, Midwestern and California areas. An income tax rate of 38% is included in the estimates.

C. H. Riesz

7. ANALYTICAL METHODS AND TESTS

Dust

Ramser, J. H. (assigned to Atlantic Refining Co.) OPTICAL METERING MEANS FOR GAS USING A SLIDING TUBE. U.S. 2,498,506 (1950) February 21.

The concentration of dust in a gas is determined and recorded by an instrument which measures the intensity of a light beam passing through the dust-laden gas. The greater the light absorption the greater the dust concentration.

W. J. Merwin

Mass Spectrometer

Ilfeld, R. M. RECORDING—MASS SPECTROMETER. *Oil Gas J.* **49**, 50, 53 (1950) *July* 6.

A new General Electric mass spectrometer is described which automatically scans a mass range of 1 to 300. Scanning is accomplished by varying the magnetic field intensity, and the relative abundance of ions is recorded on a strip chart. Chart sensitivity is automatically adjusted over a range of 30 to 1. Manual adjustments can be made to extend the scanning range to 400 and the chart sensitivity to a 100 to 1 range. The average time required to record the mass spectrum from mass 1 to mass 100 is approximately 10 minutes.

D. V. Kniebes

Mixtures

Westerdijk, J. B., Waterman, H. I., Span, H. F. O., Booy, H. and Nes, K. V. THE MAGNETO-OPTICAL ROTATION OF PURE HYDROCARBONS AND ITS APPLICATION TO THE ANALYSIS OF MIXTURES. *J. Inst. Petroleum* (British) **36**, 281-291 (1950) *May*.

Measurements of the Faraday effect of pure hydrocarbons are reported and discussed. Different structural groups of a molecule contribute additively to a constant D, which is a function of the measured Verdet constant and other physical properties of the substance. Certain limitations prevent safe use of the constant for structural analysis; however, the Verdet constant itself shows promise of being useful in this respect. The authors are convinced that measurements of the Faraday effect will be useful in the future for determining the structure of the average molecule in hydrocarbon mixtures.

D. V. Kniebes

8. GENERAL AND PHYSICAL CHEMISTRY

Adsorption

Amundson, N. R. MATHEMATICS OF ADSORPTION IN BEDS. II. *J. Phys. & Colloid Chem.* **54**, 812-820 (1950) *June*.

Several equations are derived for adsorption in beds from solution. Two cases are developed, both involving the assumption of a kinetic mechanism, i. e., that equilibrium conditions are not realized. In one case adsorption is controlling, while in the other the adsorbate exerts a back pressure. The treatment is mathematical.

S. Katz

Abstractor's note: It seems possible that the treatment employed might be applied to gas-solid systems with slight modification.

Corrosion Inhibitor

Hackerman, N. and Glenn, E. E., Jr. ORIENTATION OF A POLYFUNCTIONAL ORGANIC MOLECULE AT A STEEL SURFACE. *J. Phys. & Colloid Chem.* **54**, 497-505 (1950) *April*.

The adsorption-desorption characteristics of a commercial corrosion inhibitor were studied by the use of an electron-diffraction surface reflection technique. A possible mechanism for the firmer adsorption from dilute solutions and an explanation for the fading diffraction patterns were presented.

B. E. Hunt

Electron Microscope

McCartney, J. T., Seligman, B., Hall, W. K. and Anderson, R. B. AN ELECTRON-MICROSCOPIC STUDY OF METAL OXIDES AND METAL OXIDE CATALYSTS. *J. Phys. & Colloid Chem.* **54**, 505-519 (1950) *April*.

A study of changes occurring in metal oxides and metal oxide catalysts upon reduction was made. Electron-microscopic and adsorption methods were used to determine particle size and shape, and surface area. It was observed that the considerable sintering of the metal oxides which occurs during reduction decreases in the presence of carriers or promoters. With respect to Hüttig's theory of sintering, the observed phenomena may be explained by surface diffusion of freshly formed metal.

D. V. Kniebes

Equilibrium Relations

Kandiner, H. J. and Brinkley, S. R., Jr. CALCULATION OF COMPLEX EQUILIBRIUM RELATIONS. *Ind. Eng. Chem.* **42**, 850-855 (1950) *May*.

An earlier paper (*Gas Abstracts* **3**, 64 (1947) *April*) dealt with the mathematical theory involved in the calculation of complex equilibrium relations. The present paper demonstrates the actual computational procedure applied to both homogeneous and heterogeneous systems involving up to eleven reaction products.

S. Katz

Kinetics

Fisher, R. A. and Smith, J. M. KINETICS OF REACTION BETWEEN METHANE AND SULFUR VAPOR. *Ind. Eng. Chem.* 42, 704-709 (1950) *April.*

In the temperature range between 550 and 625° C, the reaction between methane and sulfur vapor may be predicted by assuming a second order mechanism with the sulfur in the S_2 state.

S. Katz

Thermodynamics

Gutmann, F. and Simmons, L. M. A THEORETICAL BASIS FOR THE ANTOINE VAPOR PRESSURE EQUATION. *J. Chem. Phys.* 18, 696-697 (1950) *May.*

It is shown that a theoretical basis for the Antoine vapor pressure equation may be established by an extension of the van der Waals equation in which the thermal energy is treated as the vibrational energy of an assembly of Einstein oscillators.

S. Katz

Kobe, K. A. and Pennington, R. E. THERMOCHEMISTRY FOR THE PETROCHEMICAL INDUSTRY. PART XII—OXIDES OF NITROGEN. *Petroleum Refiner* 29, 129-133 (1950) *July.*

The twelfth article in the series on the thermal properties of various compounds is devoted to nitrogen and its oxides. As in the previous articles, the following are presented: reference sources for the most reliable data, heats and free energies of formation, heat capacities and enthalpies on four different temperature scales, mean heat capacities, and the coefficients for the empirical heat capacity equations.

S. Mori

Scott, D. W., Finke, H. L., Gross, M. E., Guthrie, G. B. and Huffman, H. M. 2,3-DITHIABUTANE: LOW TEMPERATURE HEAT CAPACITY, HEAT OF FUSION, HEAT OF VAPORIZATION, VAPOR PRESSURE, ENTROPY AND THERMODYNAMIC FUNCTIONS. *J. Am. Chem. Soc.* 72, 2124-2430 (1950) *June.*

A precise calorimetric measurement of the heat capacity of 2,3-dithiabutane was made from 13 to 350° K. The triple point was determined to be 188.44° K and the boiling point 109.75° K. Vapor pressures from 0 to 130° K were measured and an empirical vapor pressure equation was constructed. The heat of fusion, heat of vaporization and entropy of both liquid and vapor were determined. A vibrational assignment using infrared and Raman data was made, and values of free energy function, heat content, entropy and heat capacity were calculated up to 1000° K.

S. Katz

West, J. R. THERODYNAMIC PROPERTIES OF SULFUR. *Ind. Eng. Chem.* 42, 713-718 (1950) *April.*

The thermodynamic properties of sulfur have been estimated or computed from available published data and the results were used to construct a Mollier diagram. The data are also tabulated. The need for further experimental work is indicated.

S. Katz

10. CHEMICAL ENGINEERING

Absorption

Houston, R. W. and Walker, C. A. ABSORPTION IN PACKED TOWERS. *Ind. Eng. Chem.* 42, 1105-1112 (1950) *June.*

The effect of molecular diffusivity on gas film coefficients was investigated in a 12 in. column packed 2 ft high with 1 in. Raschig rings. The systems investigated were ammonia, methanol, ethanol, and acetone in an air stream with water as the absorbent. The range of diffusivities covered is twofold. The data were correlated by calculating the liquid film coefficients and then calculating the individual gas film coefficients by the relationships between individual and overall coefficients. The data except for that obtained at a high liquid rate are correlated reasonably well by the 2/3 power of the gas diffusivity.

O. T. Bloomer

Distillation

Jackson, M. L. and Ceaglske, N. H. DISTILLATION, VAPORIZATION, AND GAS ABSORPTION IN A WETTED-WALL COLUMN. *Ind. Eng. Chem.* 42, 1188-1198 (1950) *June.*

Performance data are presented for the distillation of the 2-propanol-water system at total and partial reflux, and for the vaporization into air of water, 2-propanol, toluene, and water from glycerol solutions. A direct comparison of uni- and counter-directional mass transfer is thus provided and these processes are found to be similar in so far as the defining equations will permit. A unique type of column construction, and a calculation method, are presented for the evaluation of point values of the height of a transfer unit. For the distillation of 2-propanol-water these are observed to reach a maximum value over the column in most instances. This is considered to indicate an unexpected effect of composition on the mass transfer process. The j_D factor correlation is adequate for both distillation and gas absorption in a wetted-wall column, provided that the proper turbulence of the gas phase is predictable in terms of the friction factor. The Sherwood-von Karman equation likewise predicts mass transfer behavior with good accuracy if the correct relationship between eddy viscosity and eddy diffusivity is known. A value for alpha of about 1.15 is indicated for the conditions existing in a wetted-wall column.

Authors' abstract

Extraction Towers

Pyle, C., Colburn, A. P. and Duffey, H. R. FACTORS CONTROLLING EFFICIENCY AND CAPACITY OF SIEVE-PLATE EXTRACTION TOWERS. *Ind. Eng. Chem.* 42, 1042-1047 (1950) *June.*

The factors influencing the efficiency and capacity of sieve-plate extraction towers have been studied in a small glass extraction tower, using the system ethyl ether-acetic acid-water. It has been found that at normal operating rates there is little effect of hole size, within limits, on efficiency whereas a higher percentage of free area is more advantageous than a lower percentage. Higher capacities are obtained when settling time of the two phases is rapid, and when down pipes are flush with the surface of the plate from which they drop.

Authors' abstract

11. PROCESS EQUIPMENT AND INSTRUMENTATION

Automatic Control

Platt, A. M. and Farrar, G. L. APPLICATION OF AUTOMATIC CONTROL. PART I. *Petroleum Engr.* 22C, 13-16, 18 (1950) *May.*

A general discussion is presented of on-off, proportional, proportional plus reset, and proportional plus reset plus rate action type of control. Some examples are presented.

W. J. Merwin

Control Valves

Procopi, J. AUTOMATIC PROCESS SYSTEMS REQUIRE CAREFUL SELECTION OF CONTROL VALVES. *Petroleum Processing* 5, 621-624 (1950) *June.*

The power unit which actuates a control valve may be a spring opposed diaphragm motor or a springless diaphragm motor, where the underside of the diaphragm is air loaded. Single port valves are used where tight shutoff is desired. Double port valves are used in the larger sizes in order to reduce the amount of thrust on the valve stem. Linear plug valves are used when most of the pressure drop occurs across the valve. Equal percentage plugs are used where only a small percentage of the total pressure drop is available across the valve. Materials of construction of valves are listed. The flow coefficient method of valve sizing is briefly explained.

W. J. Merwin

Corrosion

Adkins, J. L. CORROSION OF CONDENSERS, PURIFYING EQUIPMENT AND PRECIPITATORS. PC 50-22. Paper presented at the American Gas Association Production and Chemical Conference at New York, N.Y., May 22-24, 1950.

The corrosion of condensers, purifying boxes, and electrostatic precipitators in a manufac-

tured gas plant are discussed. Especial attention is paid to the problems which developed in the electrostatic dust collectors.

B. E. Hunt

Flanges

Blick, R. G. BENDING MOMENTS AND LEAKAGE AT FLANGED JOINTS. PART III. *Petroleum Refiner* **29**, 129-133 (1950) *June*.

Equations are presented whereby it is possible to evaluate the effect of a change in bolt load on the leakage of a gasket.

W. J. Merwin

Blick, R. G. EXPANSION JOINTS: THEIR MAXIMUM SPACING. *Petroleum Refiner* **29**, 135-136 (1950) *July*.

A formula is derived to calculate the maximum distance between expansion joints on an installation of horizontal pipe.

W. J. Merwin

Flow Meters

Work, C. W. CHARACTERISTICS OF RING BALANCE MECHANICAL FLOW METERS. *Petroleum Refiner* **29**, 89-90 (1950) *June*.

A ring balance flow meter is a radial torque meter which utilizes a hollow ring body to convert differential pressure into a rotation which is transmitted to a recorder. One advantage of this type is that the range of the instrument is easily adjustable for any ring. Another is that there are no stuffing boxes or pressure tight bearings, which makes them adaptable for use at 15000 psig. A third advantage is that two rings may be put in one case, and the measurements may be added or subtracted. Several applications are mentioned.

W. J. Merwin

Orifice Meter

Martin, W. F. ORIFICE METER CHART CALCULATION. *Petroleum Engr.* **22D**, 17-18, 20 (1950) *May*.

Explanations are given of the use of the Martin-Warner single line integrator for computing gas flows from orifice meter charts.

W. J. Merwin

Plant Construction Costs

Brooks, G. E. HOW TO ESTIMATE PLANT CONSTRUCTION COSTS. *Petroleum Engr.* **22C**, 31-32, 34-36 (1950) *June*.

The check estimate is prepared by making estimates of the cost of individual pieces of equipment or the cost of various phases of construction, such as foundations, structural steel, boilers, etc. For this purpose the use of cost records is recommended. Data are given on individual cost items and their estimation when exact figures are unavailable.

W. J. Merwin

Water-Cooling Towers

Degler, H. E. WATER-COOLING TOWERS. PART III. OPERATION AND MAINTENANCE. *Petroleum Engr.* **22C**, 25-26, 29-30 (1950) *June*.

Scale and algae formed by water used in cooling towers can be controlled by proper treatment of the water. Two speed fan motors are recommended. Precautions to be taken in starting up and shutting down a water cooling tower are given. A regular mechanical maintenance schedule is recommended.

W. J. Merwin

12. MATERIALS OF CONSTRUCTION

Corrosion Studies

Denison, I. A. and Romanoff, M. SOIL-CORROSION STUDIES, 1946 AND 1948: COPPER ALLOYS, LEAD, AND ZINC. *J. Research Natl. Bur. Standards* **44**, 259-275 (1950) *March*.

The authors present the results of corrosion measurements of buried specimens of copper, lead, and zinc and certain of their alloys. These specimens were buried for varying periods up to 14 years in a wide variety of soils. The results and conclusions drawn from the corrosion measurements are presented.

B. E. Hunt

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